THE EFFECT OF DERIVATIVE ACTIVITIES ON INTEREST RATE RISK EXPOSURE ON BANKS LISTED AT THE NAIROBI STOCK EXCHANGE

BY

MWANZA JOSEPH

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DECLARATION

This research is my own original work and has not been presented for the award of a degree in any other university.

Signed..... Date..... 08/11/07

NAME: MWANZA JOSEPH
REG No: D61/P/8399/01

This project has been submitted for examination with my approval as University Supervisor.

Signed..... Date..... Nov 8, 2007

Nyamute W.I (Mrs).
Lecturer,
Department of Finance and Accounting

DEDICATIONS

To my Dad, Mum, Sisters and Brothers and not to forget my Grand mother (Kalondu) for giving me both social and financial support. God bless you all.

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ABSTRACT

This paper investigated whether the level of derivative activities is associated with the market's perception of banks' interest rate and exchange rate risks. Data was collected from the population of all quoted banks at the Nairobi stock exchange which totaled to 7 banks which are in the financial segment. The data collected were in the form of stock return, market index return, long term and short term interest rates and other financial data extracted from the financial reports from 2001 to 2006, which included asset book value, interest income, notional values of derivatives and book value of equity among other variables. The data used in the study was collected from the Nairobi stock exchange, Central bank of kenya and the Capital markets authority.

Investigating the effect of derivative activities on banks' interest rate and exchange rate exposures involved a two stage procedure using the augmented market model developed by Yong et al (2003). The interest rate and exchange rate exposures are estimated in stage one and are then employed as the dependent variable in the stage two regressions. Using the entire population of quoted banks, in estimating the interest rate and exchange rate exposure, the study found a positive relationship between bank stock return and long term and short term interest rate and exchange rate. The study also found there was a negative association between the banks return and short term interest rate on one hand while a positive association between the banks return and long term interest rate(correlation coefficients)

The study also found that the level of derivative activities(TDER) was positively associated with long-term interest rate exposures but negatively associated with short-term interest rate and exchange rate exposure. This suggests that the level of derivative activities in banks increases long-term interest rate exposure. Possible explanation for this finding include banks use derivatives to speculate long-term interest rate changes or that banks derivative trading activities has exposed them to long-term interest rate that are not effectively hedged. An alternative explanation is that long-term interest rate exposure is difficult to hedge relative to short-term interest rate exposure because of the lack of liquidity associated with long-term interest rate instruments.

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CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

A successful financial risk management implementation goes through three distinct stages: risk identification, measurement of risk, and managing risk (Buttimer 2001). The primary components of a sound risk management process are: a comprehensive system for measuring different types of risks; a framework for governing risk taking; individual limits; guidelines and the relevant parameters; and an adequate management information system for monitoring, reporting and controlling risks (Li, 2003).

Commercial banks are depository institutions that perform the important role of wealth creation through the intermediation process and other services that they carry out. According to Kaysap et al (2002), commercial banks engage in two distinct types of activities one on each side of the balance sheet; deposit taking and lending. In their day-to-day operations of commercial banks, interest rate risk is of major concern. One of the most important forms of risk that banks face financial intermediaries is interest rate risk which arises basically through mismatches in the maturity of rate sensitive assets and liabilities as well as off-balance sheet positions that can results in volatility in income and value as interest rates change (Kaysap et al (2002).

After playing a major role in several highly publicized financial scandals, banks' derivative activities have become increasingly controversial (Berry, 2003). These financial scandals have sparked debate regarding the values and risks of derivative activities. Berry, 2003 argues that derivatives have contributed to the development of a far more flexible, efficient and resilient financial system than existed just a quarter-century ago in the US. He however notes that most US investors view derivatives as

extremely useful for risk management but also create a host of new risks that expose the entire economy to potential financial market disruptions.

A derivative is defined by the Basel Committee on Banking Supervision (1996) as "a contract whose value depends on the price of an underlying asset, but which does not require any investment of principal in those assets. As a contract between two counterparts to exchange payments based on underlying prices or yields, any transfer of ownership of the underlying asset and cash flows becomes unnecessary". This definition is strictly related to the ability of derivatives of replicating financial instruments (Neftci, 2000). Changes in notional volumes are generally reasonable reflections of business derivative activity. Derivatives can be divided into 5 types of contracts: Swap, Forward, Future, Option and Repos. These five types of contracts can be combined with each other in order to create a synthetic asset/liability, which suits any kind of need, this extreme flexibility and freedom widely explain the incredible growth of these instruments on world financial markets (Allayannis, and Ofek 2001). Derivatives can also be seen as financial instruments widely used by all economic agents to invest, speculate and hedge in financial market (Hull, 2002). These functions are strictly related with the financial and mathematical definition of instruments and do not consider the economic contents of financial assets. Derivatives are excellent substitutes of complex investment strategies at a lower cost thus completing markets for investors (Haugh and Lo, 2001).

A number of recent studies have examined the relationship between interest rate risk exposure and banks' derivatives usage. Several of these studies have found results consistent with the notion that increased use of derivatives by banks tends to result in higher levels of interest rate risk exposure. Sinkey and Carter (1994) and Gunther and Siems (1995) found a significant, negative relationship between the balance sheet "gap" measures of interest rate risk exposure and the extent of derivatives usage by banks. These studies argue that this finding is consistent with the notion that banks use derivatives as a substitute for on-balance sheet are sources of interest rate risk exposure, rather than as a hedge. In contrast, studies examining the relationship between derivatives activity and interest rate risk exposures among thrifts have found that greater use of

derivatives has tended to be associated with lower risk exposures. For instance Brewer et al (1996) and Schrand (1996).

Another body of work that has examined the general nature of banks' interest rate risk exposures has used stock market data to measure the interest rate sensitivity of banks' common stock. These studies use two-factor market models that relate the return on the equity of individual banks to the return on the market and a term designed to capture interest rate changes. Most of these studies have examined the time series properties of the interest rate betas, attempting to assess whether these coefficients are stable over time. In general, the studies have found that the coefficients on both the market rate of return and the interest rate term vary significantly over time (Yourougou et al (1990)

The relationship between derivatives usage and lending activity has also been studied in recent years. Brewer et al (2000) estimated an equation relating the determinants of Commercial and Industrial (C&I) lending and the impact of derivatives on C&I loan lending activity. They document a positive relation between C&I loan growth and use of derivatives over a sample period from 1985 to 1992. They found that derivative markets allow banks to increase lending activities at a greater rate than they would have otherwise.

Brewer et al (2001) examined the major differences in the financial characteristics of banking organizations that use derivatives relative to those that do not. They found that banks that use derivatives grow their business loan portfolio faster than banks that do not use derivatives. Purnanandam (2004) also reports that the derivative users make more C&I loans than non-users.

Modern theories of the intermediary role of banks describe how derivative contracting and lending can be complementary activities. Diamond (1984) developed a theory of financial intermediation. In his model, banks optimally offer debt contracts to "depositors" and accept debt contracts from "entrepreneurs". Depositors delegate monitoring activities to banks that have the ability to economize the costs of monitoring

loan contracts made with entrepreneurs. He shows that diversification within a bank lowers the cost of delegated monitoring. An implication of his model is that banks should not assume any non diversifiable risk unless they have special advantages in managing them. Thus in his model, banks find it optimal to hedge all interest rate risk by interest-rate derivatives.

This use of derivative contracts to hedge systematic risks enables banks to obtain further reductions in delegation costs, and, in turn, allows banks to intermediate more effectively. Brewer et al (2000) examined the relationship between lending and derivative usage for an earlier sample of Federal Deposit Insurance Corporation insured commercial banks. Their results indicate that banks using interest rate derivatives, on average, experience significantly higher growth in their C&I loan portfolios. These results are consistent with the notion that derivative usage would help banks better cope with interest rate risk, and thereby enable them to hold more loans to earn more income from their lending activity.

1.1.1 RISKS FACING BANKING SECTOR IN KENYA

For a number of years, the industry has been experiencing challenging times. Some of the challenges have been external —a hostile operating economic environment and poor macro-economic policies. Others factors include poor supervision by the regulatory body (Central Bank of Kenya), a slow and cumbersome judicial process, poor debt culture and political patronage that had worked to the detriment of the industry (Omuodo, 2003)

The 2000 banking survey observed that general low profitability of the industry in recent years was mainly as a result of non-performing loans (NPLs). In 2003, the industry reported NPLs to the tune of KSh73 billion, representing 27 percent of total advances, banks have had to incur heavy losses as a result of massive provision and write-offs (www.mi.co.ke).

Over and above the annual financial reports, all registered Banks in Kenya are now required to publish unaudited quarterly disclosure statements that include a range of financial and prudential information. A key part of these statements is the disclosure of the banks' capital adequacy ratios. Further, now when a registered bank falls below the

minimum requirements it must present a plan to the Central Bank aimed at restoring capital adequacy ratios to at least the minimum level required (Banking survey, 2003).

Banks have been wrestling with narrowing spreads (Opiyo, 2003). Banks took advantage of the astronomical rise in Treasury bill and bond rates during the early 1990s by booking huge profits and high capital gains.

However, when sanity finally returned to the interest regime, with the introduction of the Central Bank Amendment Act 2000, known in common parlance as the "Donde Act", a totally different picture emerged. It is common knowledge that many banks forgot what their core business was and all they did was to invest on government securities (Iregi, 2003). The interest issue has many dimensions and blame has been apportioned to all and sundry. The government borrowing was blamed for crowding out the private sector and denying them access to credit (Banking survey 2003)

The uncertainty posed by the "Donde Act" caused banks to find a new niche in fees and commission to grow their revenues. However, the growth has come against declining national inflationary trends. More challenge came with Mr. Mwiraria (the then finance minister) in his 2004 budget invoking section 44 of the Banking Act, which provides that permission must be sought from the minister of finance to raise bank charges. These recent budgetary provisions are likely to have a negative impact on banks' bottom lines. The industry's profitability has declined overtime from Kshs.16 billion in 1997, KSh9 billion in 2001 and to KSh6 billion in 2002, in tandem with the decline in interest rates.

The industry's returns on both assets and capital declined marginally due to these drops in the level of profitability (Banking survey 2003).The other area of focus for banks in an effort to generate income has become consumer loans. However, they are all chasing the salaried group target market which is a very small market indeed, leading to cut throat competition (Iregi, 2003) Money loses value under inflationary conditions, if inflation is expected to rise, lending rates (nominal) will also tend to increase (Iregi, 2003). In a country that has experienced severe inflation, there is the general lack of confidence that future inflation may be less, this means a higher level of inflation is a more likely

perceived situation by banks when considering interest. Kenya experienced inflation in the period 1992-1993 when interest rate increased sharply and banks resulted to high interest charges. Generally, the future of a country's economy cannot be known with certainty. Political risk may impact a country negatively. Thus, the general economic uncertainty is captured in interest rates. This way, it can be argued that the nominal rate captures many factors that can be identified and also contains a premium for those that cannot be identified (Kibe, 2003).

On the other hand of deposits, investors are paid real interest rate in a stable environment. In an unstable environment, high rates are charged on deposits hence high interest rate risk exposure.

1.2 STATEMENT OF THE PROBLEM

Large trading losses reported from derivative transactions by banks and their corporate client has heightened public interest concerning the role of banking institutions in derivative transactions. The debate centers around two issues. The first issue is whether bank clients are adequately informed and protected about the nature of the risk involved with these transactions. The second issue is how derivative transactions affect the level of a bank's overall risk exposure with derivatives constituting a potential source of increased solvency exposure.

An important question that has arisen in the discussion of banks' exposure to interest rate and exchange rate risk concerns the role played by derivatives. The prevalence of derivatives usage by banks has increased dramatically in recent years, raising questions about the risks that banks face from these activities. In particular, derivatives provide a relatively inexpensive means for banks to alter their interest rate risk exposures. In the absence of an active derivatives market, banks would be able to adjust their interest rate risk exposures mainly by altering the composition of their assets and liabilities. In this situation, the costs of achieving any given level of interest rate risk exposure could be high, since adjusting the composition of a bank's portfolio could disrupt the bank's underlying business strategy. In addition, it might be difficult for a bank to adjust its

interest rate risk exposures quickly, since certain portions of the balance sheet could be difficult to alter over a short time horizon.

There are two schools of thought regarding derivative activities and its relationship to interest rate risk exposures.

The first school of thought contends that derivatives are relevant in managing interest rate risk exposure when used as a hedging tool and thus there is a positive relationship between derivative activities and interest rate risk exposure.

Gunther and Siems (1995) and Sinkey and Carter (1994), argues that banks view interest rate risk exposures arising from on- and off-balance sheet positions as substitutes for one another. Diamond's (1984) argues that interest-rate derivatives allow banks to lessen their systematic exposure to changes in interest rates. Schrand (1997) found that derivative activities are positively associated with lower stock-price interest rate sensitivity for a sample of publicly traded savings and loan associations Hirtle (1997) studies a sample of 139 bank holding companies and finds that derivatives have significantly associated with banks' interest rate exposure for the sample period of 1986 to 1994. Kwan (1991) found a significant relationship between balance sheet characteristics and banks' interest rate risk exposure.

The second school contends that derivatives are used as a trading instrument for speculation purposes and thus there is no relation with interest rate risk exposure. Flannery and James (1984), found a negative and significant relation between the measure of bank stock interest rate sensitivity and the bank's net short asset position. Saporoschenko (2002) studied interest rate risks assumed by the various types of Japanese banks and found that individual Japanese bank stock returns are usually negatively related to long-term interest rate changes.

It is not clear a priori which of these two alternatives is more likely. Indeed, the contribution of derivatives to banks' interest rate risk exposures could vary significantly across institutions and over time, reflecting differences in factors such as the interest rate environment, customer preferences, and desired levels of interest rate risk exposure. The

evidence on this point from previous studies is somewhat mixed. The empirical evidence is not conclusive regarding the influence of derivatives on interest rate risk exposure. This disparity of results motivated this research in the area of derivatives and interest rate risk exposures. "Does the use of derivatives affect the risk of interest rate exposure?

1.3 OBJECTIVES OF THE STUDY

i. Determine the types of derivatives used by banks.

ii. Establish whether use of derivatives affect the exposure to interest rate risk.

1.4 IMPORTANCE OF THE STUDY

This study is expected to be of great interest to the following:

(i) Academics and researchers

This study will be a base of further research as a point of reference for investigating further the relationship between the extent of derivative activities and interest rate risk exposure.

(ii) Regulators and policy makers

By investigating the effect of derivative activities on banks' risks, the findings from this study will be useful in addressing regulatory concerns regarding the potential misuse of derivatives. If derivative activities are found to increase banks' risk, greater regulation or supervision might be warranted to avoid the possibility of a future banking crisis.

Examining the effect of different types of derivatives on bank risks also will assists the regulators in formulating appropriate regulation or supervision procedures. In addition, the results from this study can also assist banks in understanding if their derivative activities are risk reducing.

(iii) Investment practitioners

This study will be of use to security analyst and investors who would like to invest in the banking sector know the kinds of activities the banks are engaging in and their associated

risk and whether bank clients are adequately informed about the nature of the risk involved with derivative transactions.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

Academic treatment of the interest rate risk of financial institutions can be traced to Samuelson (1945), who stated that the value of a bank's equity is susceptible to changes in interest rates as a result of the structure of its assets and liabilities. Hicks (1946) showed that the relative duration of various streams of payments plays a key role in determining the present value of these cash flows when the discount rate changes. However, the notion of portfolio theory and systematic risk was not developed at that time, and it was until later when Stone (1972) extended the market model by incorporating the effects of debt indices.

The first study was conducted by Martin & Keown (1977) who indirectly tested Stone's (1972) proposition during the period 1973–75. Using ten randomly selected portfolios, the full covariance model with the variance of the market model was compared. The analysis was based on the assumption that if there were significant nonzero covariances in residual security returns, then the variance of the market model would underestimate the portfolio variance (directly estimated from portfolio returns and without using the market model). In essence, what was tested was the presence of sources of extra market co variation in security returns. It was concluded that unexpected co variation might be related to interest rate movements. The problem with such methodology, however, is that it does not actually identify any of the risk factors. It simply shows an element of risk, which is not explained by the market portfolio.

The link of this extra market co variation with a particular risk factor is arbitrarily based on an observed historical sensitivity rather than an explicit statistical relationship. The

same year Lloyd & Schick (1977) using monthly returns from NYSE, examined the 1969–72 period. A very small proportion (8.3%) of banks exhibited a significant coefficient on a long-term index and no extra market sensitivity for firms in the Dow Jones Industrial Average (DJIA) was identified.

The low sensitivity of the banking group was attributed to the fact that banks might be more sensitive to changes in short-term rates. One peculiar characteristic of their results is the lack of significance of the market portfolio in the banking sector. Moreover, in the empirical analysis, three different versions of the model were estimated, which did not add any power to the objectives of their research. Chance (1979) and Gultekin et al (1979), however, questioned Lloyd & Schick (1977) measurement and computation of the market model and, hence, their results. Chance used a bigger sample and Gultekin et al (1979) used the same sample and period as Lloyd & Schick (1977). The findings did not indicate any negative betas for the market index and there was not any violation of the assumption of normally distributed returns. The different results were attributed to computational errors, misinterpretation and inappropriate use of statistics made by Lloyd & Schick (1977)

2.2 TYPES OF DERIVATIVES

Futures contract -. It's an agreement that requires a party to the agreement either to buy or sell something at designated future date at a predefined price. It provides an opportunity for the participants to hedge against the risk of adverse price movements.

Forward contract- an agreement for the future delivery of something at a specified price at the end of a designated period of time.

Option contract- a contract in which the writer of the option grants the buyer of the option, the right, but not the obligation, to purchase from or sell to the writer, some asset at a specified price within a specified period of time or at a specified date.

Swaps- an agreement whereby two parties agrees to exchange periodic payments. The amount of the payments exchanged is based on some predetermined dollar principal, which is called the notional principal amount or notional amount. They are of various types such as interest rate swap, interest rate-equity swap, equity swap and currency swap.

2.3 DERIVATIVE ACTIVITIES AND RISKS

Hedging theory often assumes that firms use derivatives for risk reduction. According to Sinkey and Carter (2000), banks' derivative activities can increase the value of firm by reducing the expected costs of financial distress either for the bank or for client firms or both, by reducing expected taxes, by reducing agency costs, by increasing bank fees and by enhancing bank-customer relationships. However, there are also theories predicting the use of derivatives by firms' owners to increase firm riskiness. These theories build on the Black and Scholes (1973) analogy between options and corporate claims. According to the analogy, higher volatility is beneficial to equity owners – holders of call options - as an option payoff increases when the volatility of the underlying asset's value increases. Hence, shareholders of leveraged firms have incentives to increase firm riskiness to transfer wealth from bondholders to shareholders.

Hentchel and Kothari (2001) investigate whether U.S. firms systematically reduce or increase their riskiness with the level of derivative activities. They found that firms' use of derivatives does not measurably increase or decrease their return volatility. The association between derivative usage and risk is of interest in the banking industry because banks are the major users of derivatives and they use derivatives for various purposes.

In particular, banks use derivatives as end-users to hedge on-balance sheet risks and as dealers to increase non-interest revenue. As derivatives provide an easy means for banks to alter their risk profile, regulators and investors are particularly concerned about whether banks use derivatives primarily to reduce risk from other banking activities (hedging) or to achieve higher levels of risk exposures (speculating).

Diamond (1984) developed a theory of financial intermediation in which banks have monitoring advantages as compared to small depositors. But they also suffer from incentive problems due to the delegated monitoring on behalf of their depositors. He shows that diversification within a bank lowers the cost of delegated monitoring and generates net benefits of intermediation services. The incentive to hedge interest rate risk increases with the cost of bank failure since assuming these risks increases the likelihood of bank failure without providing any incentive benefits to the banks as delegated monitors.

In the context of non-financial firms, Smith and Stulz (1985) showed that hedging can increase firm value by reducing the variability of the firm's cash-flows, which in turn lowers the expected cost of bankruptcies. Another benefit of hedging comes by way of increased debt-capacity of the firm as argued by Stulz (1996) and Leland (1998).

Froot et al. (1993) developed a model in which they endogenize the distress costs. In their model, external funds are costlier than the firm's internally generated cash. If a firm experiences negative shock to its cash flow, it would be forced to raise funds from external market and thus incur the deadweight costs to meet its investment needs. Firms may have to forego positive NPV projects in some bad states (low internal cash-flow) of the world. Hedging strategies add value to the firm by removing these inefficiencies. In line with these theoretical models if banks receive subsidized deposit insurance from the FDIC, it may lead to a moral hazard problem by providing excessive risk-taking incentives to the owners of the banks.

However regulatory and market discipline can help minimize this problem to a large extent. Since, banks also raise funds from other sources; the extent of risk-seeking behavior would be further limited. Purnanandam (2004) analyzes the issue of 'hedging' vs 'risk-shifting' incentives for non-financial firms and shows that such risk-shifting incentives dominate the risk-management incentives of only those firms that are very close to financial distress.

Choi (1996) used a three-factor model that incorporates changes in both interest rates and exchange rates to examine the relationship between derivatives and interest rate and exchange rates exposures. They estimated the model for a sample of 59 large U.S. banking companies and find a significant relationship between the resulting interest and exchange rate betas and the banks' interest rate and exchange rate derivatives usage. Because the focus of their analysis is on the joint impact of interest and exchange rate derivatives on risk exposure, it is difficult to derive a clear indication of the net impact of derivatives on interest rate risk exposure from their results.

Gorton and Rosen (1995) used the limited data available from banks' Reports of Condition and Income (the Call Reports) on the maturity distribution of interest rate derivatives to derive estimates of the direction of interest rate risk exposure arising from these positions. Their conclusion is that the interest rate exposures arising from interest rate swaps tend to be mostly, though not completely, offset by exposures from other bank activities. Further, they found that the extent of offsetting varies with bank size, with large dealer banks experiencing the greatest amount of offset. Thus, their results can also be interpreted as suggesting that the net impact of banks' interest rate swap activity is to increase interest rate risk exposures.

Yong et al (2003) used a two steps model to determine the effect of derivatives on banks' risks. They investigated whether the level of derivative activities is associated with the market's perception of Asia-Pacific banks' interest rate and exchange rate risks. Their results suggest that the level of derivative activities (especially interest rate derivatives) is positively associated with long-term interest rate exposure but negatively associated with short-term interest rate exposure.

Additionally, derivative activities were found to reduce banks' exchange rate risk exposure when country effect is taken into account. The significant positive association between the level of derivative activities and long-term interest rate exposure suggests the

need for better supervision or more stringent derivative disclosure requirements to avoid the possibility of a future banking crisis in the region.

An alternative explanation is that long-term interest rate exposure is difficult to hedge relative to short-term interest rate exposure because of the lack of liquidity associated with long-term interest rate instruments. This result is consistent with Hirtle (1997) who found that for the 1991-1994 period, increases in the use of interest rate derivatives corresponded to greater long-term interest rate exposure for a sample of U.S. bank. Chaudhry and Reichert (1999) and Reichert and Shyu (2003) also found that the use of options increases banks' interest rate exposures.

In order to extend this earlier work on derivatives and interest rate risk exposure, another body of researchers has examined the general nature of banks' interest rate risk exposures. In particular, these studies have used stock market data to measure the interest rate sensitivity of banks' common stock.

These studies use two-factor market models that relate the return on the equity of individual banks to the return on the market and a term designed to capture interest rate changes. The coefficient on the interest rate term (the interest rate "beta") can be interpreted as a measure of interest rate risk exposure. Most of these studies have examined the time series properties of the interest rate betas, attempting to assess whether these coefficients are stable over time. In general, the studies have found that the coefficients on both the market rate of return and the interest rate term vary significantly over time (Kane and Unal (1988), Yourougou (1990), Neuberger (1991), Song (1994), Robinson (1995), and Hess and Laisathit (1996).

Firms actively using derivatives show to have different risk exposure than non-using (Hentschel and Kothari, 2001), and banks using interest rates derivatives experienced a greater growth in their commercial and industrial loan portfolios than non-using (Brewer, et al 2000). A size barrier to the use of over the counter derivatives has been underlined by Hogan and Malmquist (1999), which, however, is consistent with profit-maximization.

Peek and Rosengren (1996) cast doubts about the derivatives trading activities of troubled banks, most of all because there seemed to be a risk seeking behaviors and then an increase in unmonitored moral hazard. Flannery and James (1984a, 1984b), Kwan (199l) attempted to explain the variation in the interest rate sensitivity measure across banks by using balance sheet data to account for differences in banks' activities. They found a significant relationship between balance sheet characteristics and banks' interest rate risk exposure.

Micro-economic results about derivatives can be summed up also looking at the single instrument: Future contracts increase market efficiency by lowering trading costs and information asymmetry and liquidity because all expiration dates and daily setting of margins are given. Transparency depends on the international and national laws and is generally very high.

Futures are widely used to hedge and speculate, both on financial and commodity markets. Notional value of future contract does not represent the exposure of the two counterparts; as long as they settle their position each day through margins. Option contracts have the same effects of futures on markets.

The only drawback can be the unclear effect on volatility of the underlying, because futures tend to lower underlying asset's volatility, whereas options do not give unique empirical results. The option notional value is not a proxy of the exposure, but the premium paid to open or close the position represents resources invested.

Swaps are generally over the counter contracts with a longer duration than futures and options, and satisfy the need of a single client of the bank, a firm or financial institution. They tend to create new investment opportunities in order to hedge against any type of risk or speculate. In these contracts the notional value of the contract does not represent the risk taken by the two or more counterparts, but periodical payments.

Forwards are over the counter future contracts, not standardized and created on the client needs. They showed to have almost the same properties of futures. Repos are time financing operations between the European Commercial Banks and the European inter-bank system; they are used to finance liquidity and not to speculate or hedge, so that the inclusion of them is given only to their structure of time operations, but not to their financial function.

The introduction of derivatives by completing information of markets on prices of the underlying on the expiring date of the contract satisfies the price discovery property, that is the expiring date derivative price can be approximated with the capitalized today spot price, given constant risk free interest rate. The introduction of derivatives might affect the risk of financial markets: from a macroeconomic point of view risk can be divided in systemic and non-systemic.

The first can be diversified and thus lowered; the second is not affected by portfolio diversification and is a characteristic of the market and country. Systemic risk can be lowered by portfolio diversification and derivatives play a central role in this process, given the absence of exogenous shocks; in the presence of shocks, they behave like other financial instruments, and can exacerbate the effects of shocks for traders, brokers and markets as a whole.

Donmez and Yilmaz (1999) argue that mature derivatives market on an organized exchange leads to a better risk management and better allocation of resources in the economy. This is confirmed also by Hunter and Marshall (1999), who affirm that derivatives trading may increase informational efficiency of financial markets and provide instruments for more effective risk management.

In the current literature, there seems to be no clear evidence about an increase of risk, either systemic or non-systemic, in the absence of shocks, in presence of exogenous shocks, they tend to exacerbate the effects, according to their different risk propensity. Hunter and Marshall (1999) and Hunter and Smith (2002) underline the important

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relationship between systemic risk and derivatives, given that the presence of systemic risk needs the central bank to act as a liquidity supplier for financial markets. Derivatives are the widest financial innovation of the last 30 years and their impact on financial markets and operators, investment strategies and risk management, money and fiscal policy are very important theme to look at for economists.

2.4 FACTORS AFFECTING INTEREST RATE

There has been considerable empirical research on the interest rate exposures of commercial banks. Empirical research on the interest rate risk of banks in the U.S. generally document that U.S. commercial banks are exposed to interest rate risks (Flannery and James, 1984; Akella and Chen, 1990).

Madura and Zarruk (1995) investigated Canadian, German, Japanese, U.S. and British banks and found that bank interest rate risk varies among countries and that interest rate risk is greater for non-U.S. banks relative to U.S. banks. Similar to U.S. banks, other studies focusing on Asia-Pacific nations have also demonstrated that banks are typically more sensitive to changes in long-term interest rates. In addition, bank equity is also found to be more sensitive to changes in interest rates after deregulation of the banking system (Broussard et al. 2003).

Saporoschenko (2002) studied interest rate risks assumed by the various types of Japanese banks. He observes that individual Japanese bank stock returns are usually negatively related to long-term interest rate changes.

Interest rates determine the value (price) of transactions in money and capital markets; affect the relationship between spot and forward foreign exchange rates. Given that the vast majority of the assets and liabilities of financial institutions are financial securities whose values are immediately affected by interest rate changes, financial institution managers are intensely interested in estimating changes in interest rates. Many factors affect interest rates and therefore the inherent risk. These factors include inflation, the

real interest rates in the economy, default risk, liquidity risk, special provisions, and term to maturity (Cornett & Saunders 1999).

(A) Inflation

The first factor to affect interest rates is actual or expected inflation. Specifically, higher levels of actual or expected inflation are associated with higher levels of interest rates, and interest rates decline as inflation decreases. The intuition behind the positive relationship between interest rates and inflation is that an investor who buys a financial asset must earn a higher interest rate when inflation increases to compensate for the increased opportunity cost of forgone consumption of real goods and services.

(B) Real Interest Rates

A real interest rate is the interest rate that would exist on a default-free security if no inflation were expected. As such, it measures society's relative preference for consuming today rather than tomorrow. The higher the preference to consume today (i.e. the higher its time value of money or rate of time preference), the higher is the real interest rate.

(C) Default or Credit Risk

Default risk is the risk that a security's issuer will default on that security by missing an interest or principal payment. The higher the default risk, the higher the interest rate on the security. Not all securities exhibit the same default risk. Treasury securities have no default risk and therefore carry the lowest interest rate.

Some borrowers, such as corporations or individuals, have less predictable cash flows, and therefore lenders charge them an interest rate premium reflecting their probability of default. The difference between a quoted interest rate on a security and a treasury security with similar maturity, liquidity, and other features is called a default or credit risk premium.

(D) Liquidity Risk

A highly liquid asset is one that can be sold at a predictable price with low transaction costs and thus can be converted into its full cash value at short notice. The interest rate on a security reflects its relative liquidity with highly liquid assets carrying the lowest interest rate all other factors constant. Likewise if a security is not liquid, investors add a

liquidity risk premium to the market interest rate on the security. Liquid markets exist for government securities and bonds of large corporations.

(E) Special Provisions or Covenants

Numerous special provisions or covenants that may be written into the legal description of a security also affect interest rates. Some of these provisions include taxability, convertibility and callability. In the US and other developed markets, interest payments on municipal securities are tax free to the holder at the federal or state and local levels. Thus, the required interest rate demanded by a municipal bond holder is smaller than that on a comparable taxable bond, such as a treasury bond and a corporate bond which are taxable.

Similarly, a convertible security offers the holder the opportunity to exchange one security for another type of the issuer's securities at a preset price. Because of the value of this conversion "option", the convertible security holder requires a lower interest rate than a comparable nonconvertible security holder requires. In general, special provisions that provide benefits to the security holder are associated with lower interest rates, and special provisions that provide benefits to the security issuer are associated with higher interest rates.

(F) Term to Maturity

The term to maturity or the term structure of interest rates compares the market yields or interest rates on securities, assuming that all characteristics such as default risk and liquidity risk except for maturity are the same. The yield curve for treasury securities is the most commonly reported and analyzed yield curve.

The shape of the yield curve has taken many forms but four most common shapes are: the upward sloping; the downward sloping; the humped yield curve; and the flat yield curve.

Explanations for the shape of the yield curve fall predominantly into three categories: the unbiased expectation theory; the liquidity premium theory; and the market segmentation theory. According to the unbiased expectation theory for the term structure of interest rates, at a given point in time the yield curve reflects the market's current expectations of future short-tem rates. Thus, an upward-sloping yield curve reflects the market's expectations that the short-term rates will rise throughout the relevant time period. A flat

yield curve reflects the expectation that short-term rates will remain constant over the relevant period. The theory posits that the long-term rates are a geometric average of current and expected future short-term interest rates.

The liquid premium theory of the term structure of interest rates is based on the idea that investors will hold long-term maturities only if they are offered a premium to compensate for future uncertainty, which increases with an asset's maturity. This theory states that the long-term rates are the geometric average of the current and expected short-term rates plus a "liquidity" or risk premium, which increases with maturity of the security.

Market segmentation theory argues that individual investors and financial institutions have specific maturity needs. Accordingly, the theory does not consider securities with different maturities as perfect substitutes. Thus, interest rates are determined by distinct supply and demand conditions within a particular market segment.

2.5 THE DETERMINANTS OF THE USAGE OF DERIVATIVES

There are several theories of optimal hedging, most of which rely on the introduction of some friction to the classical Modigliani and Miller paradigm. According to Stulz (1984), corporate hedging arises as a result of managerial risk aversion. Smith and Stulz (1985), argue that the structure of the tax code or the transaction costs of financial distress could prompt firms to undertake hedging activities.

Froot et al. (1993), posits that hedging mitigates the underinvestment problem that would result when cash flow is volatile and access to external financing is costly. DeMarzo and Duffie (1995), project that corporate hedging is optimal when managers have private information on the firm's expected payoff despite shareholders' ability to hedge by themselves.

Empirical examination of hedging theories has been difficult due to the general unavailability of data on hedging activities. A firm's exact position in derivatives is privately held information, and is considered a very important component of strategic

competitiveness. It is only recently that corporations have been required to disclose in footnotes in their annual reports, the fair value of derivatives they are using. In the absence of reported information on derivatives, most of the earlier studies used survey data to examine why firms use derivatives (Yong et al. 2003) Nance et al. (1993) used survey data on Fortune 500 firms' use of forwards, futures, swaps, and options and found that firms that hedged faced more convex tax functions, had less coverage of fixed claims, were larger, and had more growth options in their investment opportunity set.

Petersen and Thiagarajan (2000) study suggests that a potential benefit of derivative usage comes from its ability to allow a firm to maintain smooth operating policies. The derivative user banks make less adjustments to their on-balance sheet maturity GAPs than the non-users.

This means that the user banks need to adjust their lending, borrowing and investing policies much less than the non-user banks. This provides an additional channel by which derivative instruments can provide smooth cash-flows to the firm. Apart from generating cash in the adverse states of the world, derivative decisions can smooth cash-flows through its interaction with the operating decisions also (Yong et al. 2003).

This finding is broadly consistent with the model of Froot et al. (1993) in which hedging allows firms to undertake optimal investment policies in future. Berger and Udell (1992) hypothesized that relationship banks will tend to smooth market shocks for their customers by smoothing interest rates over the business cycle.

Berlin and Mester (1999) study suggest that banks with a stable pool of deposits, which leaves them less vulnerable to exogenous interest rate shocks, will provide more loan interest rate smoothing.

Sinkey and Carter (1994) found a significant, negative relationship between the balance sheet gap measures of interest rate risk exposure and the extent of derivatives usage by banks. This is consistent with the idea that banks use derivatives as a substitute for on-balance sheet sources of interest rate risk exposure, rather than as a hedge.

Brewer, 2000 et al examined the relationship between derivatives activity and interest rate risk exposures among thrifts they found that greater use of derivatives has tended to be associated with lower risk exposures.

Recently, studies have focused on the type of hedging, recognizing that different factors can be important for each type of hedging. In particular, Geczy et al. (1997) examined currency hedging activities for a sample of Fortune 500 firms. They find that firms' use of currency derivatives is positively related to the amount of research and development expenditures, which is consistent with the use of hedging to reduce underinvestment size, which is consistent with fixed-costs of hedging explanations, and exposure factors such as foreign income and trade.

Tufano (1996) examined commodity hedging activities in the gold mining industry. He finds that firms' use of commodity derivatives is negatively related to the number of options their managers and directors hold, and positively related to the value of their stock holdings, evidence consistent with theories of managerial risk aversion.

Petersen and Thiagarajan (2000) found that firms with different (similar) derivatives strategy can still have very similar (different) risk-management strategy after considering their non-derivatives positions. Thus it becomes important for empirical studies to consider a broader measure of hedging that includes both these aspects of a firm's risk-management behavior.

Allayannis and Weston (2001) found a significant effect of derivatives on firm valuation and Guay and Kothari (2003) found that derivative instruments can generate only a modest level of cash-flows in the bad states of the world. The generation of interest rate risk arising from maturity mismatch between deposits and loans creates the possibility that volatile interest rate conditions will negatively affect banks' financial condition and at worst give rise to insolvency. Therefore, suitable hedging of increased interest rate risk arising from strong loan growth is of crucial importance to financial stability.

Kashyap and Stein (1995) show for the US that after monetary restriction different types of banks face a similar drop in deposit quantities. If some banks set prices less competitively, this implies that these banks have easier access to alternative deposits, probably because they are perceived as less risky by depositors.

Banks should not assume any risks that are not diversifiable unless they have special advantages in monitoring them. Thus banks find it optimal to hedge all interest rate risk either by using derivatives contract or by matching the maturity of assets and liabilities. Diamond (1984) argues that banks should hedge all systematic risks in which they don't have any special monitoring advantages. For non-banking firms, Smith and Stulz (1985) found out that the hedging of interest rate risk can increase firm value by lowering the expected transactions cost of bankruptcy.

Froot and Stein (1996) developed a version of a costly-external finance model for banking to prescribe risk management policies for banks. While interest-rate exposure can be easily changeable, it can nevertheless have large impacts on bank values. Banks can consciously choose certain exposures and leave them unchanged over time or they can hedge away interest rate risk. This aspect of interest-rate risk management makes exposures in part a policy decision of the bank with material value implications.
Other motivations for managing risks include managerial risk aversion, costly external financing, information asymmetry between the insiders and outsiders of the firm and convexity of taxes (Stulz, (1984), Smith and Stulz, (1985), DeMarzo and Duffie, (1991) and Froot, et al (1993)).

2.6 INTEREST RATE AND EXCHANGE RATE RISK EXPOSURES OF BANKS

There has been considerable empirical research on the interest rate and exchange rate risk exposures of commercial banks. Empirical research on the interest rate risk of banks in the U.S. generally document that U.S. commercial banks are exposed to interest rate risks (Flannery and James, 1984; Akella and Chen, 1990).

Madura and Zarruk (1995), investigating Canadian, German, Japanese, U.S. and British banks, found that bank interest rate risk varies among countries and that interest rate risk is greater for non-U.S. banks relative to U.S. banks. Similar to U.S. banks, other studies focusing on Asia-Pacific nations have also demonstrated that banks are typically more sensitive to changes in long-term interest rates (Faff and Howard, 1999; Saporoschenko, 2002). In addition, bank equity is also found to be more sensitive to changes in interest rates after deregulation of the banking system (Faff and Howard, 1999; Broussard et al., 2003).

Kho and Stulz (2000) examined the impact of the Asian crisis and International Monetary Fund program announcement on bank stocks and also examined banks' currency exposure. They point out that during the Asian crisis, banks in the Philippines and Indonesia had significant exposures to foreign exchange movements. In contrast, exchange rate changes had no significant impact beyond their impact on general market movements on Korean, Thai and Malaysian banks. They suggest that these results may be due to 'banks were hedging more than commentators believed they are' or that 'the market expected currency losses to be offset by bailouts'.

Saporoschenko (2002) studied both interest rate and foreign exchange risks assumed by the various types of Japanese banks. He observed that individual Japanese bank stock returns are usually negatively related to long-term interest rate changes and not very sensitive to foreign exchange changes.

2.7 EFFECT OF DERIVATIVES ON BANKS' RISKS

Several empirical studies have investigated the impact of derivatives on banks' risks. Investigating the effect of interest rate derivatives on the risk of U.S. bank holding companies, Hirtle (1997) found that derivatives have played a significant role in shaping bank's interest rate risk exposure in recent years, an increase in the use of interest rate derivatives corresponds to greater interest rate risk exposure.

Investigating the impact of exchange rate derivatives on bank risk of 59 U.S. commercial banks, Choi and Elyasiani (1997) found that the use of derivatives creates systematic risk beyond the level reflected in a bank's traditional financial statement exposures. Chaudhry and Reichert (1999) examined the effect of interest rate derivatives on four different measures of banks' risks, namely, total risk, systematic risk, interest rate risk, and unsystematic risk. They reported that interest rate options consistently increase all four types of bank risks, but the use of interest rate swaps reduces bank risks.

Chaudhry et al. (2000) investigated the effect of different foreign currency derivative types (namely, forwards, swaps, futures and options) on bank risks. Again, their findings suggested that the use of options tends to increase all measures of bank risks while swaps are used primarily for hedging. Forward contract contribute minimally to risks.

Reichert and Shyu (2003) extend previous studies by focusing on international dealer banks in the U.S., Japan and Europe to investigate how the derivative activities of these banks affect market, interest rate and exchange rate risks using a multifactor market model approach and EVaR approach.
Consistent with previous evidence, they found the use of options increases the interest rate beta for all banks, while interest rate and currency swaps generally reduce risk.

CHAPTER 3

3.0 RESEARCH METHODOLOGY

This research took the form of an empirical study based on data recorded at the Nairobi Stock Exchange (NSE) which included the banks published financial reports and share values.

3.1 POPULATION

The whole population of seven (7) quoted banks from 2001 to 2006 was studied. The study was restricted to quoted banks only due to envisaged problem of obtaining data from unquoted banks.

3.2 DATA COLLECTION

The data for this study was obtained from balance sheet extracts and other financial disclosures contained in the financial statements and reports filled at the NSE. These disclosures contained among other data, exposures to interest rate risk and risk management, which includes the use of derivatives. Market values of shares and interest rate on bonds and Treasury bills was also be obtained from the NSE and Central Bank of Kenya reports in form of monthly bulletins.

To examine the effect of derivative activities (usage) on banks' risks, data on notional value of derivatives and other balance sheet control variables was obtained from the 'Notes to the Financial Statements' in the annual reports.

To control for on-balance sheet interest rate and credit risk, the study included non interest income/total revenue (NONINT) and loans/total assets (LOANS) in the regression as additional variables to proxy for on-balance sheet interest rate risk.

3.3 DATA ANALYSIS

The study employed the two stage procedure used by Yong et al (2003). The interest rate and exchange rate risk exposures was estimated in stage one and then employed as the dependent variable in the stage two regressions.

3.3.1 MODELS

(A) ESTIMATION OF BANKS' INTEREST RATE EXPOSURE

Following the methodology adopted by Yong et al (2003) the interest rate risk betas are estimated for each bank by employing the following augmented market model:

$$R_{it}=\beta_i + \beta_{im}R_{mt} + \beta_{iLTIRt} LTIR_t + \beta_{iSTIRt}STIR_t + \beta_{EX} EX + \varepsilon_t \ldots\ldots (i)$$

Where;

R_{it} = return on bank stock *i* in period *t*;

R_{mt} = return on the market index

$LTIR_t$ = return on long-term government bond index(10 year Treasury Bond)

$STIR_t$ = holding period return on 3 month Treasury bills

EX = exchange rate of Kshs per unit of USD

ε_t = error term

β = beta coefficient which is a measure of exposure

Past studies often found that the use of a bond index return and holding period return as interest rate factors will yield a positive coefficient which indicates a positive relationship between long term and short term interest rate changes and the return on bank stocks (Flannery and James, 1984). Thus, a positive exposure of β_{LTIR} and β_{STIR} would indicate that when there is a decrease in interest rate holding period return, the return on bank stock will be affected negatively.

As for the exchange rate exposure, a positive exchange rate exposure would imply that when local currency appreciates, a bank's stock return is impacted positively.

(B) EFFECT OF DERIVATIVE ACTIVITIES ON BANKS' INTEREST RATE EXPOSURES

To investigate the effect of derivative activities on banks' interest rate and exchange rate exposures, the stage two cross-sectional regressions assumes that long-term interest rate, short-term interest rate and exchange rate betas, estimated from Equation (1) above, are a function of both off-balance sheet derivative activities and traditional on-balance sheet banking activities as follows:

$$\beta_{LTIR} = \alpha_0 + \alpha_1 TDER_{it} + \alpha_2 LNASSET_{it} + \alpha_3 CAP_{it} + \alpha_4 LIQ_{it} + \alpha_5 NIM_{it} + \alpha_6 NONINT_{it} + \alpha_7 LOANS_{it} + \alpha_8 RESit + \varepsilon_{it} \quad \text{.....(ii)}$$

$$\beta_{STIR} = \alpha_0 + \alpha_1 TDER_{it} + \alpha_2 LNASSET_{it} + \alpha_3 CAP_{it} + \alpha_4 LIQ_{it} + \alpha_5 NIM_{it} + \alpha_6 NONINT_{it} + \alpha_7 LOANS_{it} + \alpha_8 RESit + \varepsilon_{it} \quad \text{.....(iii)}$$

$$\beta_{EX} = \alpha_0 + \alpha_1 TDER_{it} + \alpha_2 LNASSET_{it} + \alpha_3 CAP_{it} + \alpha_4 LIQ_{it} + \alpha_5 NIM_{it} + \alpha_6 NONINT_{it} + \alpha_7 LOANS_{it} + \alpha_8 RESit + \varepsilon_{it} \quad \text{.....(iv)}$$

Where;

TDER = notional value of derivatives/ total assets

LNASSET =natural logarithm of total assets

CAP =book value of equity/total assets

LIQ =liquidity assets/total assets

NIM =net interest income/total assets

NONINT =non-interest income/total assets

LOANS =loans /total assets

RES =loan loss reserves/total assets

β_{LTIR} = Beta coefficient for Long term interest rate exposure

β_{sTIR} = Beta coefficient for Short term interest rate exposure

β_{EX} = Beta coefficient for Exchange rate exposure

If banks use derivatives to hedge their interest rate and exchange rate exposures, a negative coefficient of TDER in Eq. (2), (3) and (4) is expected because a greater extent of derivative activities is associated with a lower level of interest rate and exchange rate exposure. On the other hand, a positive coefficient for TDER would suggest that banks use derivatives for speculation as greater use of derivatives corresponds to greater risk exposure. To control for on-balance sheet interest rate and credit risk, NONINT and LOANS was included in the regression.

CHAPTER 4

4.0 DATA ANALYSIS AND FINDINGS

4.1 MEASURES OF INTEREST RATE RISK SENSITIVITY AND EXPOSURE

An evaluation of the Interest Rate Risk (IRR) position typically entails an examination of two key factors:

1) Sensitivity of the institution's balance sheet to changes in interest rates, and
2) The capacity of the institution to absorb losses resulting from movements in interest rates.

The sensitivity of an institution's balance sheet depends on the composition of the institution's assets, liabilities, and off-balance sheet contracts. The capacity of an institution to absorb losses depends in large part on its capital position.

4.2 TYPES OF DERIVATIVES USED BY BANKS

The first objective of this study was to determine the derivatives used by the quoted banks.

For the quoted banks studied, disclosure about trading and derivatives activities was provided on a consolidated basis and appeared in two main places in the annual report:

(a) Management's discussion and analysis:

(b) Annual financial statements

The following derivatives were found to be used by the quoted banks.

i. Forward rate agreement (FRA)
ii. Futures and options on debt instruments
iii. Interest rates and cross-currency swaps
iv. Forward foreign exchange positions

4.3 BANK EXPOSURE TO INTEREST RATE AND EXCHANGE RATE RISKS

Table 1 contains the list of quoted banks at the Nairobi stock exchange (NSE) for the period from 2001 to 2006. Banks that were not quoted during this period were ignored and thus not included in the study.

Table 2(C) {regression model) shows that there is a strong positive relationship between the bank stock return and long term, short term interest rate and exchange rate. All the beta coefficient which were a measure for the risk exposures were found to be positive. This indicates that the banks stocks are positively affected by increases in the level of long and short term interest rate and exchange rate. Thus, a positive exposure of β_{LTIR} and β_{STIR} indicates that when there is an increase in interest rates, the return on bank stock will be affected positively. As for the exchange rate exposure, a positive exchange rate exposure implies that when local currency appreciates, a bank's stock return is impacted positively. The positive exposure suggests that if there is an increase in interest rate (decrease in interest rate holding period return), the return on bank stocks will on average be positively affected.

The number of significant coefficients for short-term interest rate exposure is less than long-term interest rate exposure indicating that banks are more sensitive to long-term interest rate relative to short-term interest rate. This finding is consistent with the observations from past research that bank stock returns are more sensitive to changes in long-term interest rates relative to short-term interest rates (Madura and Zarruk, 1995; Faff and Howard, 1999). Exchange rate exposure is positive, indicating that when local currency appreciates, the banks' stock returns are positively affected(increase).

Table 2(E) shows a summary of t-test, using both the one and two tail tests, calculated t, {P(T<=t)} is less than t-Critical (tc). This confirms the hypothesis that banks stocks are positively affected by increases in long and short term interest rate and exchange. Thus long term interest rate and exchange rate have a positive association with bank stock

return whereas the short term interest rate have a negative association with the bank stock return(see Table 2D)

4.4 EFFECTS OF DERIVATIVE ACTIVITIES ON BANKS' INTEREST RATE AND EXCHANGE RATE EXPOSURE

Prior literature investigating the effect of derivative activities on banks' risks typically employ the raw value of interest rate and exchange rate beta estimated from Eq. (1) as the dependent variable in stage two regressions. A positive relationship in the context of positive exposure indicates that the use of derivatives (TDER) increases the level of exposure while in the context of negative exposures would indicates that the use of derivatives reduces the level of exposure (Nguyen and Faff, 2003).

The results in Table 3(C) Panel A indicates that there is a significantly positive relationship between the extent of derivative activities and long-term interest rate exposure. This suggests that the level of banks derivative activities increases long-term interest rate exposure. Possible explanation for this finding include banks use derivatives to speculate long-term interest rate changes or that banks derivative trading activities has exposed them to long-term interest rate that are not effectively hedged. An alternative explanation is that long-term interest rate exposure is difficult to hedge relative to short-term interest rate exposure because of the lack of liquidity associated with long-term interest rate instruments. This result is consistent with Hirtle (1997) who found that for the 1991-1994 period, increases in the use of interest rate derivatives corresponded to greater long-term interest rate exposure for a sample of U.S. bank.

Loans as a proxy for interest rate risk was found to be significant and positive when the raw values of short-term interest rate beta are used as the dependent variable. This result reveals that banks that have a high proportion of short term loans have more exposure to short-term interest rate risk. This suggests that banks may have higher proportion of short-term loans as opposed to long-term loans in their balance sheet.

The results for short-term interest rate exposure reported in Table 3(C) Panel B(β_{STIR}) seem to support the hypothesis that banks use derivatives for hedging. Significant negative coefficient is found for TDER in the regression, indicating that the greater the extent of banks' derivative activities, the lower their short-term interest rate exposures. The use of derivatives appears to be more effective in reducing banks' short-term interest rate exposures than long-term interest rate exposures.

There is a significant positive relationship between the extent of derivative activities and long-term interest rate and exchange rate exposure. Possible explanation for this finding is that banks use derivatives to speculate long-term interest rate changes and exchange rate. An alternative explanation is that long-term interest rate and exchange rate exposure are difficult to hedge relative to short-term interest rate exposure because of the lack of liquidity associated with long-term interest rate instruments.

Table 3(C) Panel 1 (β_{LTIR}) indicates that banks have a high concentration of loans, which is commonly repriced more often than once in a year, thus they have less exposure to long term interest rate risk (a negative association). Panel 2 (β_{STIR}) suggests that banks are more reliant on non-interest income and thus have more exposure to short term interest rate risk (a positive association)

Panel 3(β_{EX}) reports the regression results to investigate the effect of derivative activities(TDER) on banks' exchange rate exposure. The results indicate that the level of derivative activities corresponded with decrease in exchange rate exposure (a negative relationship) this finding is contrary to Choi and Elyasiani (1997) who found that currency derivatives increases U.S. banks risks exposure.

Table 3(E) show a summary of t-test calculated so as to test the hypothesis that banks use derivatives to speculate their long term interest rate exposure and hedge their short term interest rate and exchange rate exposures. Using both the one and two tail tests, calculated t, {P(T<=t)} is less than t-Critical (tc). This indicates that the greater the extent of banks' derivative activities, the lower their short-term interest rate and exchange rate

exposures. The use of derivatives appears to be more effective in reducing banks' short-term interest rate exposures than long-term interest rate exposures.

CHAPTER 5

5.0 CONCLUSIONS, LIMITATION AND RECOMMENDATION

5.1 CONCLUSION

This study investigated the effects of derivative activities on interest rate risk exposure on banks listed at the N.S.E. The findings suggest that banks are positively exposed to long-term interest rate and exchange rate and negatively exposed to short-term interest rate risks. Using both a short-term and long-term measure of interest rate exposure has produced some interesting empirical findings. The use of derivatives does seem to reduce banks' short-term interest rate exposure but not their long-term interest rate exposure. Possible explanation for this finding include banks use derivatives to speculate long-term interest rate changes or that banks derivative trading activities has exposed them to long-term interest rate that are not effectively hedged. An alternative explanation is that long-term interest rate exposure is difficult to hedge relative to short-term interest rate exposure because of the lack of liquidity associated with long-term interest rate instruments.

Since previous studies only investigated the risk effect of derivative activities using long-term interest rate exposures, these findings contributes to the literature by suggesting that the use of short-term versus long-term interest rate exposures yields different results. Bank stock returns are more sensitive to changes in long-term interest rates relative to short-term interest rates

The association between derivative usage and risk is of interest in the banking industry because banks are the major users of derivatives and they use derivatives for various purposes. In particular, banks use derivatives as end-users to hedge on-balance sheet risks and as dealers to increase non-interest revenue as derivatives provide an easy means for banks to alter their risk profile.

5.2 LIMITATIONS

The major limitation for this study was that it only focused on the quoted banks at the Nairobi Stock exchange for the period 2001 to 2006. This may not have been adequate to draw inferences on the entire banking sector since unquoted banks also use derivatives to hedge as well as for speculation purposes.

All the banks analyzed in this study did not report the types of derivatives and their corresponding notional values but only reported the total notional values of derivatives they used as a group. Thus analysis could not be done based on the types of derivatives used but rather the study analyzed the total notional values of the mentioned derivatives.

5.3 RECOMMENDATION

The findings that derivatives are used for hedging short-term interest rate exposure should provide some comfort to regulators and investors. However, the significant positive association between derivatives activities and long-term interest rate and exchange rate exposure suggests the need for better supervision or more stringent derivative disclosure requirements to avoid the possibility of a future banking crisis. Since derivative related losses can cause the failure of large banks, precipitating a collapse of the payment and credit system especially in a bank-centred economy, regulators and investors must be concerned about the potential misuse of derivatives.

The fact that many of these derivative activities are off-balance sheet has made it very difficult for regulators and investors to assess the level of banks' risk exposures. Derivative activities will reduce banks' risk if they are effectively used for hedging purposes or meeting customers' needs. On the other hand, if banks use derivatives for speculative purposes, derivative activities will increase banks' risk as there is now concern that due to the accounting loophole, banks are using the profit from interest rate swaps speculation to cover up their losses.

The findings that derivatives are used for hedging short-term interest rate and exchange rate exposure should provide some comfort to regulators and investors. However, the significant positive association between derivatives activities and long-term interest rate exposure suggests

the need for better supervision or more stringent derivative disclosure requirements especially for interest rate derivatives to avoid the possibility of a banking crisis.

For future research, data should be collected for both the quoted and unquoted banks and other financial institutions so as to be able to analyze and determine which banks or financial institutions are effectively using derivatives and for what purposes, whether they use them for speculation or hedging their exposures.

The banks should also be encouraged to report their derivatives uses by classifying them into types and the corresponding notional value so as to analyze the impact of each type of derivative to interest rate and exchange rate risk exposures.

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APPENDICES

APPENDIX 1: SUMMARY STATISTICS

Table 1: QUOTED BANKS AT THE NAIROBI STOCK EXCHANGE FOR PERIOD 2001 TO 2006

	BANK
1	C.F.C BANK
2	KENYA COMMERCIAL BANK
3	BARCLAYS BANK OF KENYA
4	STANDARD CHARTERED BANK
5	DIAMOND TRUST BANK
6	N.I.C BANK
7	NATIONAL BANK OF KENYA

Table 2: ESTIMATION OF BANKS' INTEREST RATE AND EXCHANGE RATE RISK EXPOSURE (Model 1)

(A) DATA VARIABLES

YEAR	Bank return	Mkt Return	LTIR	STIR	EX
2001	20.5	31.19	13	12.73	78
2002	25	38.95	13.15	8.94	79.8
2003	22.5	39.65	13.15	3.67	79.5
2004	24.5	42.7	13.4	2.859	79.7
2005	22	41	13.2	8.437	79
2006	20.57	44.35	13.2	6.827	76

(B) DESCRIPTIVE STATISTICS

	Bank return	*Mkt Return*	*LTIR*	*STIR*	*EX*
Mean	22.5117	39.6400	13.1833	7.2438	78.6667
Standard Error	0.7794	1.8733	0.0527	1.4896	0.5976
Median	22.2500	40.3250	13.1750	7.6320	79.2500
Mode	#N/A	#N/A	13.1500	#N/A	#N/A
Standard Deviation	1.9091	4.5886	0.1291	3.6489	1.4638
Sample Variance	3.6448	21.0552	0.0167	13.3143	2.1427
Kurtosis	-1.7908	2.7215	2.1570	-0.5281	1.9911
Skewness	0.3308	-1.4533	0.5500	0.2574	-1.5385
Range	4.5000	13.1600	0.4000	9.8710	3.8000
Minimum	20.5000	31.1900	13.0000	2.8590	76.0000
Maximum	25.0000	44.3500	13.4000	12.7300	79.8000
Sum	135.0700	237.8400	79.1000	43.4630	472.0000
Count	6.0000	6.0000	6.0000	6.0000	6.0000
Confidence Level(95.0%)	2.0035	4.8154	0.1355	3.8293	1.5361

(C) REGRESSION MODEL

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.90
R Square	0.81
Adjusted R Square	0.05
Standard Error	1.86
Observations	6.00

Significance F	0.61

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-127.60	158.18	-0.81	0.57
Mkt Return	0.16	0.39	0.40	0.76
LTIR	4.08	13.42	0.30	0.81
STIR	0.16	0.42	0.38	0.77
EX	1.13	0.75	1.50	0.37

(D) CORRELATION MATRICES

	Bank return	*Mkt Return*	*LTIR*	*STIR*	*EX*
Bank return	1.0000				
Mkt Return	0.2631	1.0000			
LTIR	0.5487	0.7887	1.0000		
STIR	-0.4391	-0.7325	-0.7983	1.0000	
EX	0.8025	-0.1216	0.2558	-0.2896	1.0000

(v) T-TEST STATISTICS

	Bank return	*Mkt Return*
Mean	22.5116667	39.6400000
Variance	3.6448167	21.0552000
Observations	6.0000000	6.0000000
Pooled Variance	12.3500083	
Hypothesized Mean Difference	0.0000000	
Df	10.0000000	
t Stat	-8.4419370	
P(T<=t) one-tail	0.0000037	
t Critical one-tail	1.8124615	
P(T<=t) two-tail	0.0000073	
t Critical two-tail	2.2281392	

Table 3. EFFECT OF DERIVATIVE ACTIVITIES ON BANKS' INTEREST RATE AND EXCHANGE RATE EXPOSURES (Model 2)

(A) VARIABLES

YEAR	TDER	LNASSET	CAP	LIQ	NIM	NONINT	LOANS	RES
2001	0.2167	11.3821	0.0262	1.1367	0.0795	0.0774	0.5260	0.0732
2002	0.1838	11.4150	0.0243	1.1676	0.0666	0.0567	0.6653	0.0775
2003	0.1722	11.4521	0.0415	1.1844	0.0670	0.0604	0.6081	0.0733
2004	0.1703	11.5174	0.0391	1.1542	0.0619	0.0518	0.6377	0.0654
2005	0.2028	11.5363	0.0368	1.1424	0.0694	0.0514	0.6376	0.0543
2006	0.1539	11.5857	0.0359	1.1346	0.0674	0.0497	0.5340	0.0507

(B) DESCRIPTIVE STATISTICS

	TDER	*LNASSET*	*CAP*	*LIQ*	*NIM*	*NONINT*	*LOANS*	*RES*
Mean	0.1833	11.4814	0.0340	1.1533	0.0686	0.0579	0.6015	0.0657
Standard Error	0.0094	0.0318	0.0029	0.0080	0.0024	0.0042	0.0238	0.0045
Median	0.1780	11.4847	0.0364	1.1483	0.0672	0.0543	0.6229	0.0693
Mode	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Standard Deviation	0.0230	0.0779	0.0071	0.0196	0.0059	0.0103	0.0583	0.0110
Sample Variance	0.0005	0.0061	0.0000	0.0004	0.0000	0.0001	0.0034	0.0001
Kurtosis	-0.8297	-1.5540	-1.6180	-0.5881	3.1784	3.0822	-1.8113	1.8225
Skewness	0.3880	0.0297	-0.6696	0.8180	1.4208	1.7309	-0.5777	0.5384
Range	0.0627	0.2037	0.0172	0.0498	0.0176	0.0277	0.1394	0.0268
Minimum	0.1539	11.3821	0.0243	1.1346	0.0619	0.0497	0.5260	0.0507
Maximum	0.2167	11.5857	0.0415	1.1844	0.0795	0.0774	0.6653	0.0775
Sum	1.0997	68.8886	0.2039	6.9198	0.4116	0.3475	3.6088	0.3943
Count	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
Confidence Level (95.0%)	0.0241	0.0817	0.0074	0.0206	0.0062	0.0108	0.0612	0.0116

(C) REGRESSION STATISTICS

	β_{LTIR}	β_{STIR}	B_{e1}
Multiple R	1	1	1
R Square	1	1	1
Adjusted R Square	-6.98492E-10	-6.98492E-10	-6.98492E-10
Standard Error	5.31903E-17	1.19656E-18	2.91042E-16
Observations	6	6	6
	Coefficients	Coefficients	Coefficients
Intercept	14.979	2.176	-228.942
TDER	411.487	-27.616	-463.290
LNASSET	9.334	-0.761	2.973
CAP	108.506	-52.517	-771.162
LIQ	26.481	-2.281	218.120
NIM	-649.563	122.480	-1000.212
NONINT	-1326.515	81.077	3143.206
LOANS	-188.233	14.540	286.463
RES	860.852	-70.495	-2166.597

(D) CORRELATION MATRICES

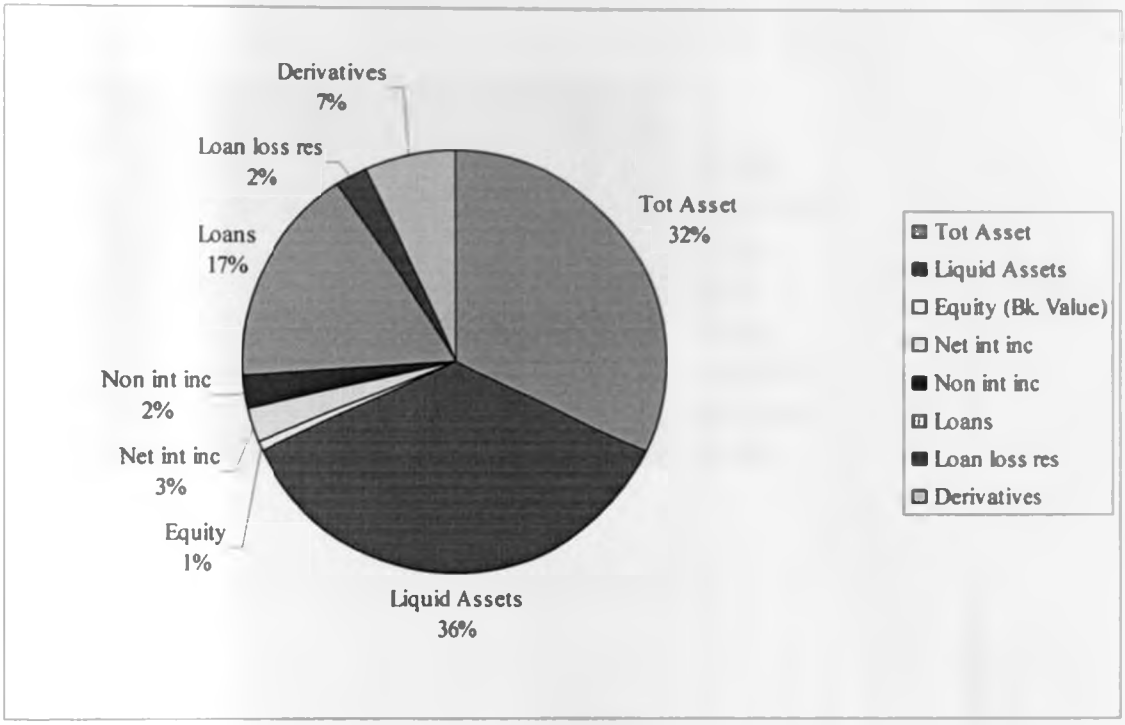
	TDER	*LNASSET*	*CAP*	*LIQ*	*NIM*	*NONINT*	*LOANS*	*RES*
TDER	1.0000							
LNASSET	-0.6115	1.0000						
CAP	-0.5116	0.6325	1.0000					
LIQ	-0.2515	-0.3577	0.2348	1.0000				
NIM	0.7679	-0.5366	-0.5424	-0.4381	1.0000			
NONINT	0.6851	-0.8353	-0.5127	-0.0441	0.8438	1.0000		
LOANS	-0.0512	-0.0304	0.0859	0.5740	0.6375	-0.4757	1.0000	
RES	0.3103	-0.9205	-0.4580	0.6349	0.1768	0.6148	0.2566	1.0000

(E) T-TEST

	TDER	***LTIR***	**STIR**	**EX**
Mean	0.183289676	53.75408	1.168681	88.97102
Variance	0.000529524	0.27709	0.346556	2.740755
Observations	6	6	6	6
Pearson Correlation		-0.58816	0.75226	0.240454
Hypothesized Mean Difference		0	0	0
Df		5	5	5
t Stat		242.8902	4.222863	131.7976
P(T<=t) one-tail		1.12E-11	0.004152	2.38E-10
t Critical one-tail		2.015049	2.015049	2.015049
P(T<=t) two-tail		2.24E-11	0.008305	4.77E-10
t Critical two-tail		2.570578	2.570578	2.570578

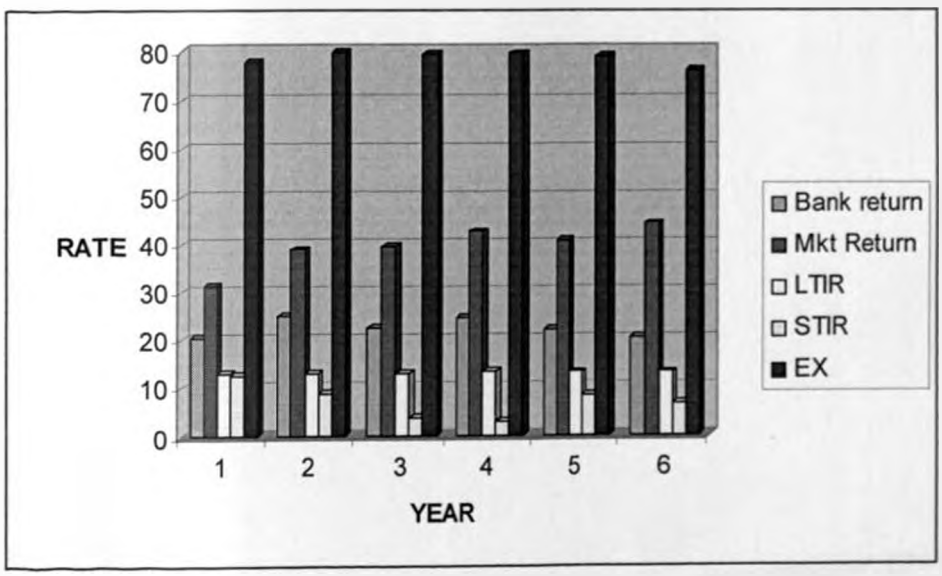
Appendix 2: CHARTS AND GRAPHS

(A) Pie chart



(B) Bar graphs

(a)Estimation of banks interest and exchange rate exposure



(b) Effect of derivative activities on banks' interest rate and exchange rate exposures

Coefficients (Bar graph)